

# Risk-Based Management of Dredged Material

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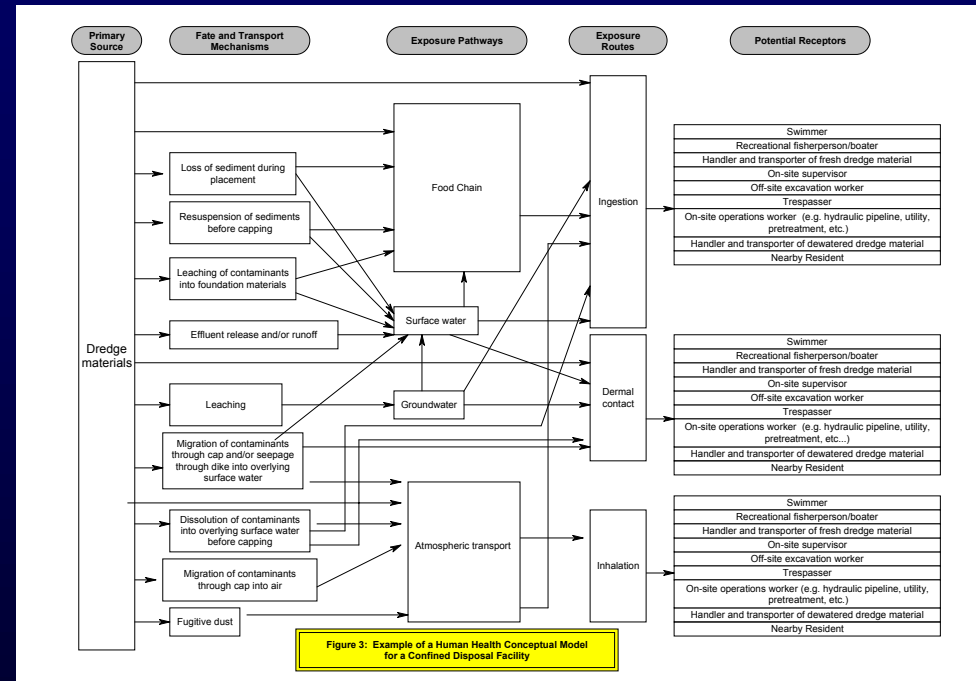
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# The Need For Quantitative Decision-Making Tools

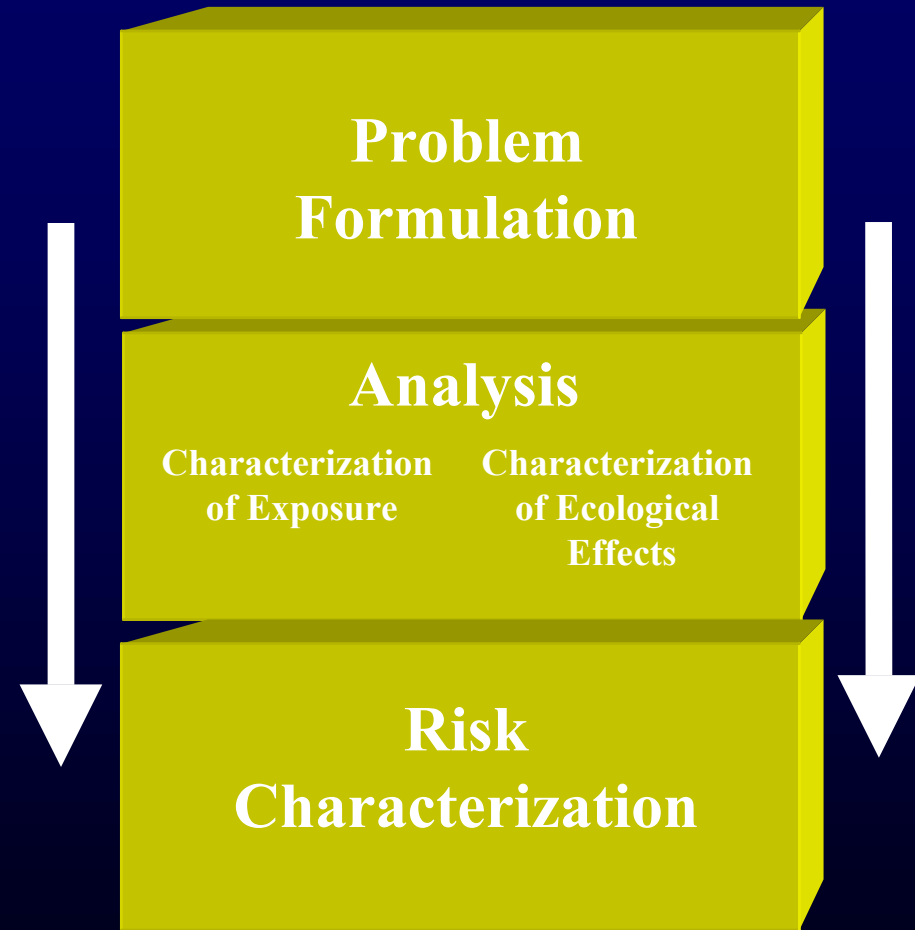
- DM management has become more complex
  - Large volumes of information
  - Uncertainties can be large
- Must reduce uncertainty and variability in the decision making process



# DOER: RISK FOCUS AREA

## OBJECTIVE:

Develop logical environmental risk assessment guidance with supporting analytical tools to integrate information and quantify uncertainty



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## APPROACH

- Develop risk assessment guidance for DM
- Characterize & reduce sources of uncertainty in decision making
- Develop comparative risk methods
- Demonstrate the application of risk assessment in DM management
- Produce software, databases and models for risk-based decision making

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## Risk Guidance: “Ecological and Human Health Risk Assessment Guidance for Aquatic Disposal of Dredged Material”

- Framework for assessing environmental risk for aquatic disposal
- Covers human health and ecological risk
- Sources for additional information
- Upland/CDF risk guidance document in preparation
- [www.wes.army.mil/el/dots/doer](http://www.wes.army.mil/el/dots/doer)

# Why do we need risk guidance for upland/CDF disposal?

- The risks are real
- RCRA exclusion for DM contingent on our ability to assess and manage risks from upland pathways
- Facilitates use of comparative risk analysis

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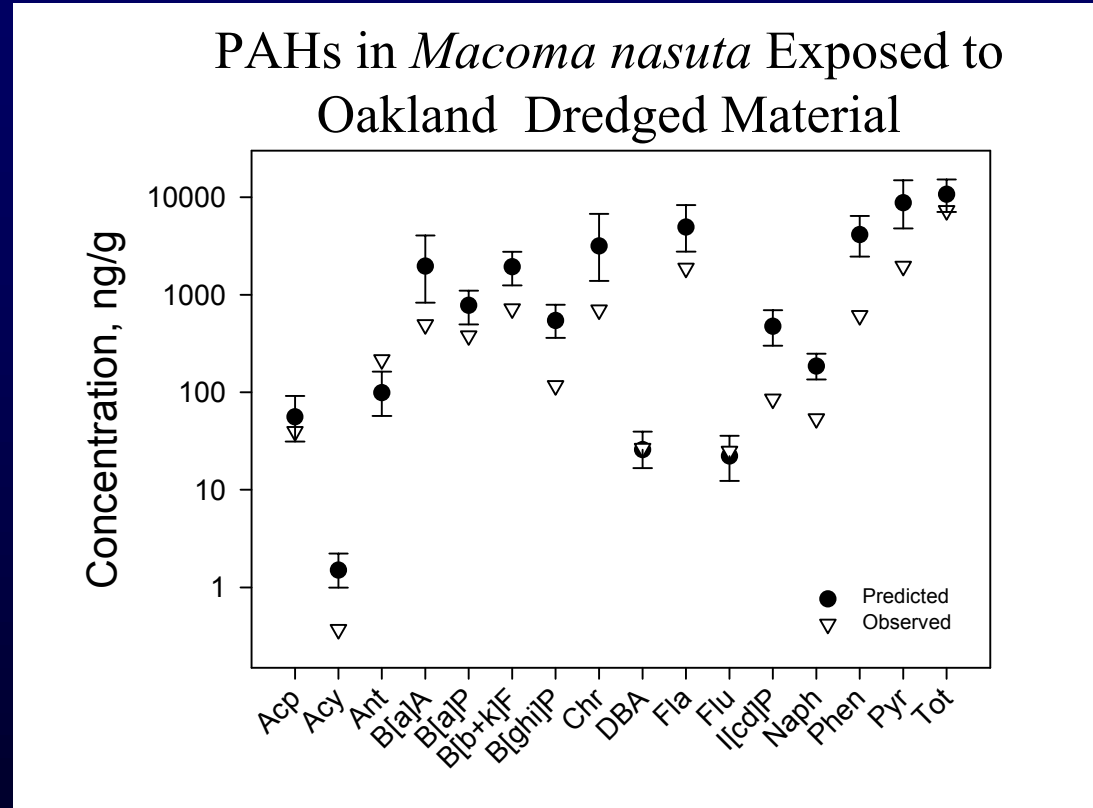
## Journal Manuscript: “Sources of Uncertainty in Environmental Evaluations of Dredged Material,”

- Submission to the journal *Human and Ecological Risk Assessment*; manuscript based on TR DOER-3
- Describes importance of uncertainty in environmental decision making
- Identifies uncertainty sources for dredged material evaluations
- Ranks uncertainty sources
- Provides recommendations for reducing uncertainty

# Reducing Uncertainty in Bioaccumulation

- Screening models are essential elements of risk assessment
- Acceptance of TBP as a screening method for bioaccumulation requires demonstrating
  - 1. 1. 1. 1. 1.

– PCBs, dioxins, pesticides



Clarke and McFarland, 1999, ET&C 19:360-367

$$\text{TBP} = \text{AF} \times \frac{C_s}{\% \text{ TOC}} \times \%L$$



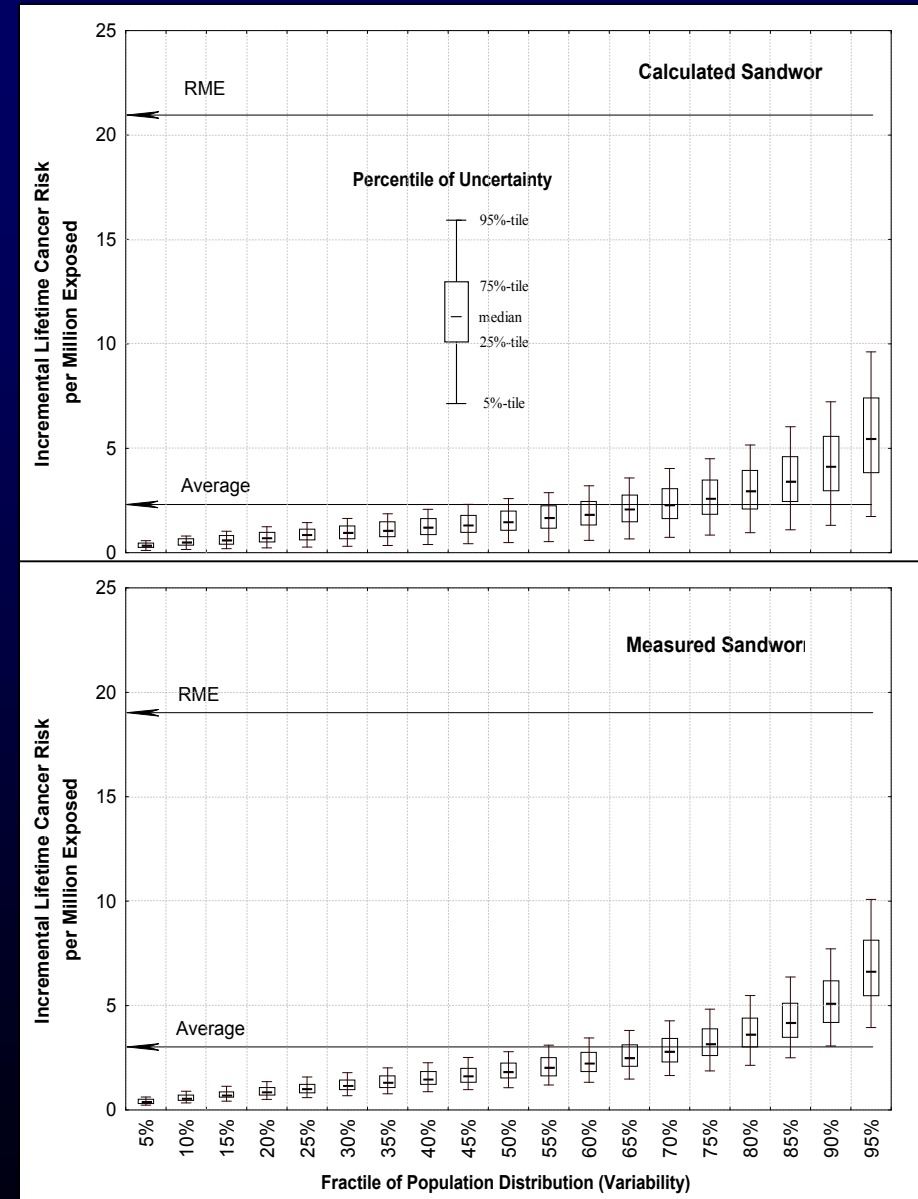
# DOER: RISK FOCUS AREA

Journal Manuscript: “Uncertainty and Variability in Risks From Trophic Transfer of Contaminants in Dredged Sediments ,”

- Submission to the journal *Risk Analysis*
- Evaluated trophic transfer of PCB using NY Harbor data by adapting Gobas model for two-dimensional Monte Carlo analysis
  - Uncertainty and variability were disaggregated
- Evaluated effects on human health cancer and non-cancer endpoints

# Application of Trophic Transfer Modeling to Evaluate DM

- Human health effects evaluated by using mean, RME and probabilistic input parameters
  - RME always over-estimated risk
- Parameter variability contributed most to the range in risk estimates



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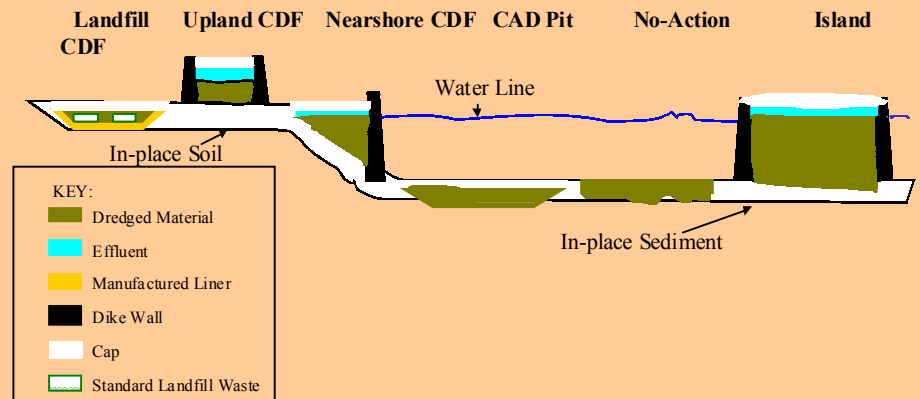
## Major FY00-01 Activities, Products

- Develop an approach for using comparative risk assessment for decision making, TR
- Conduct a quantitative risk analysis at ecologically relevant spatial and temporal scales. IA
- Develop a spreadsheet tool to evaluate risk (screening level) from contaminant trophic transfer. TN
- Incorporate dredged material scenarios into the Army Risk Assessment Modeling System (ARAMS)

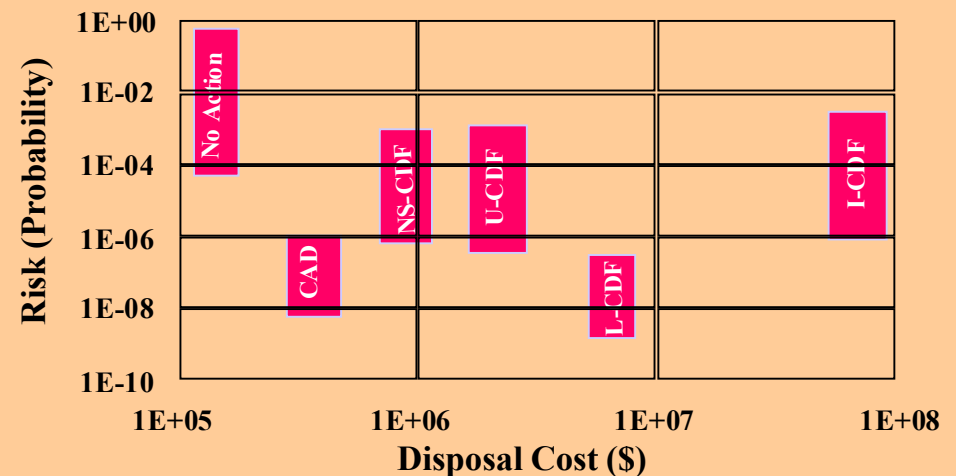
# Comparative Risk

- Disposal alternatives differ significantly in exposure pathways and receptors of concern
  - Human populations
  - Aquatic vs. upland fauna
- Effective decision making requires comparing risks using equivalent terms
  - “apples and apples”

## Disposal Alternatives

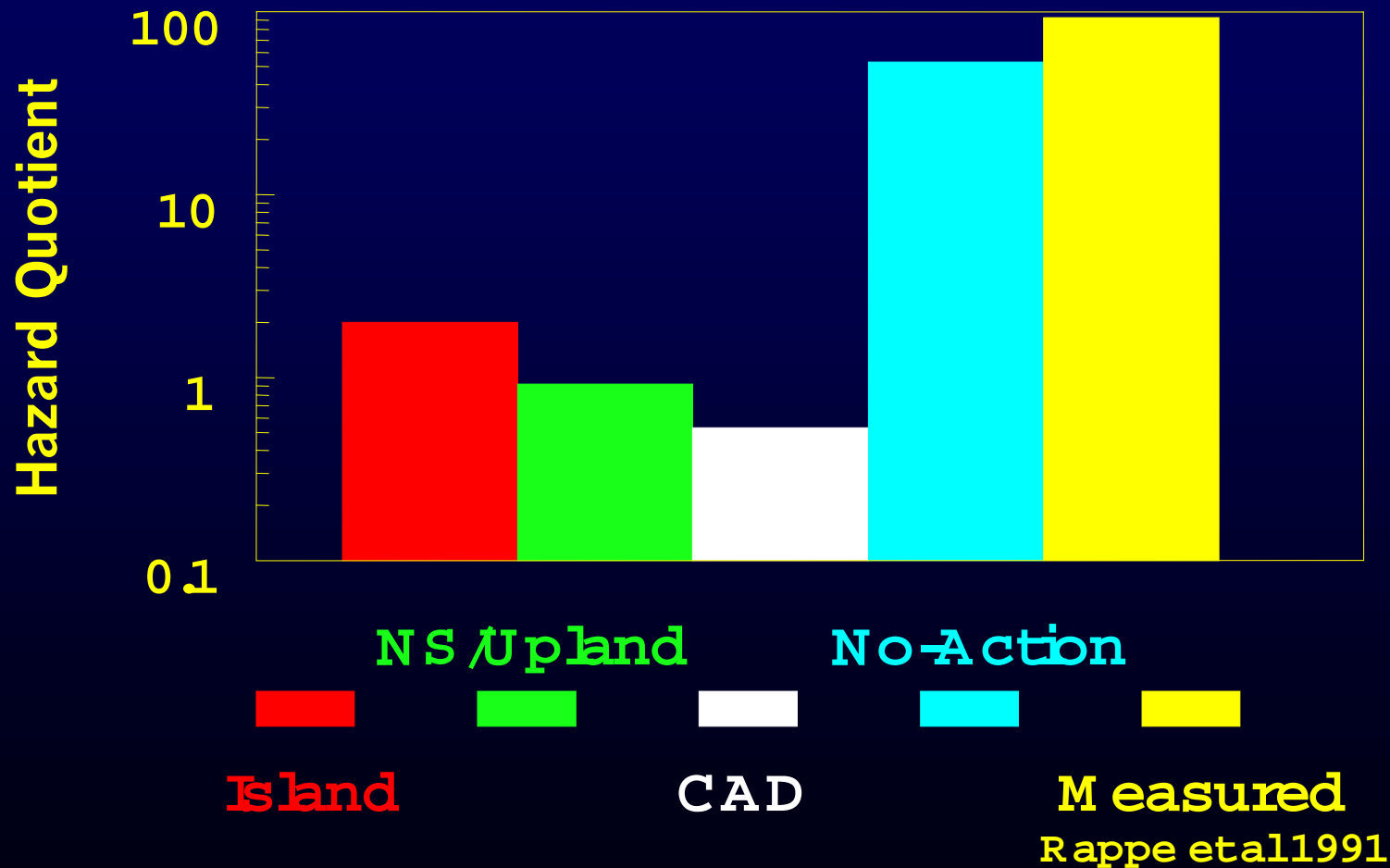


## Risk Management



# Case Study: NY/NJ Harbor

## Hazard Quotients for 2,3,7,8-TCDD in Fish

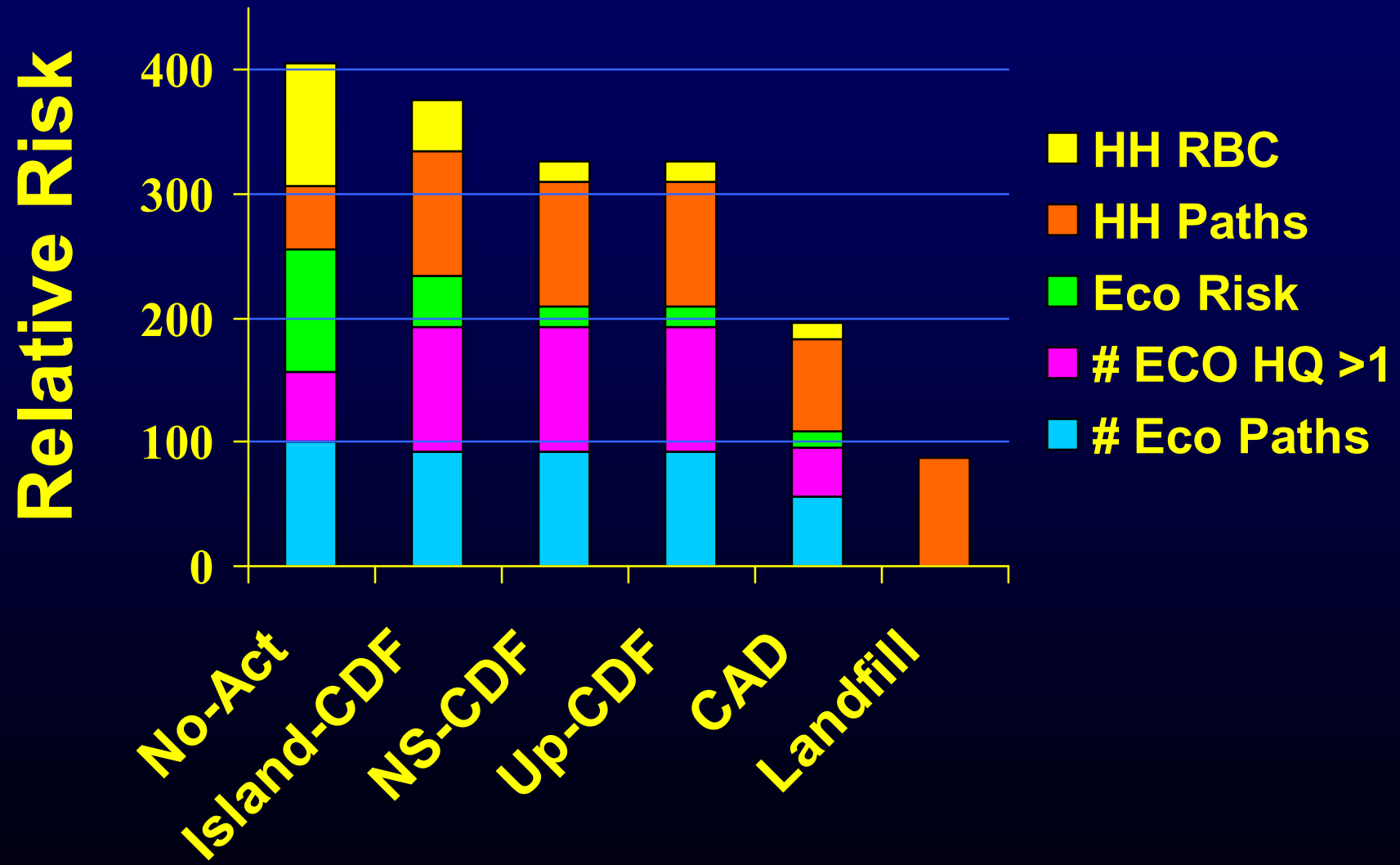


# Case Study: NY/NJ Harbor

## Comparative Risk Evaluation Criteria:

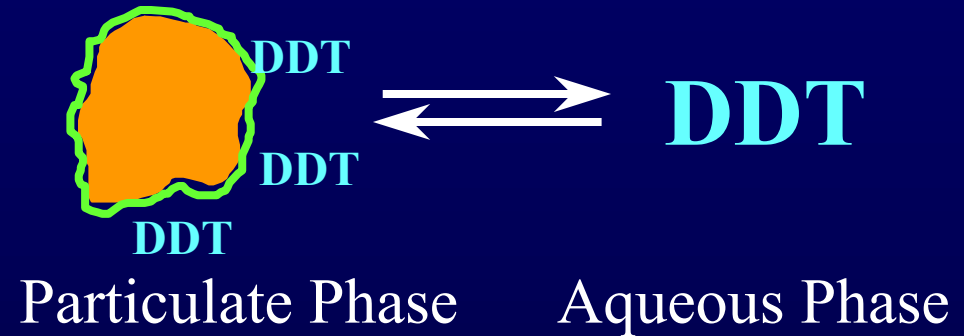
- Ratio of Area/ Capacity (acres/  $10^6$  cu yd)
- Ratio of Duration/ Capacity (years/  $10^6$  cu yd)
- Number of Complete Ecological Exposure Pathways
- Number of Ecological Hazard Quotients  $> 1$
- Magnitude of Ecological Hazard Quotients
- Number of Complete HH Exposure Pathways
- Ratio of Conc. of COCs in Fish/Risk-based Conc.

# Comparative Risk Evaluation

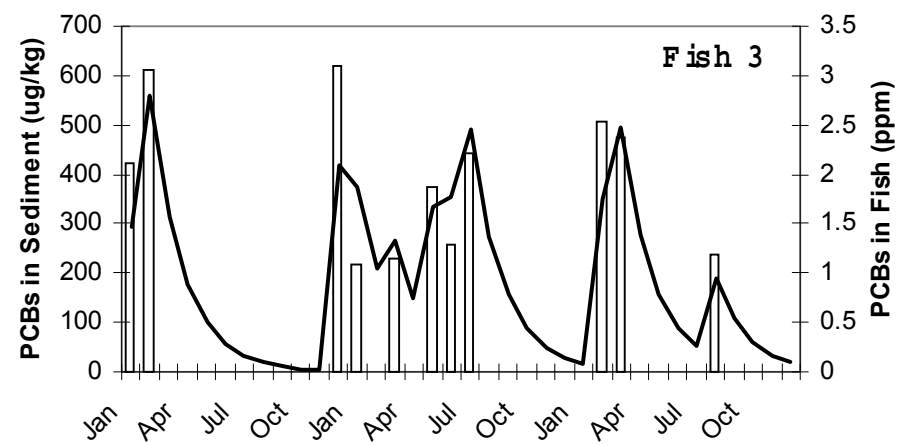
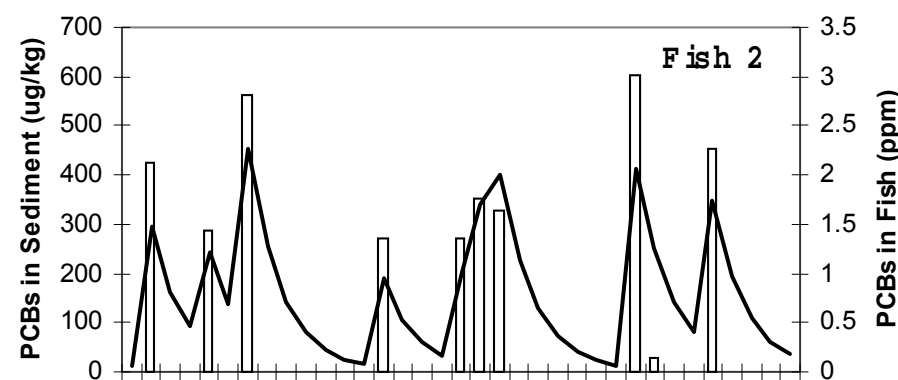
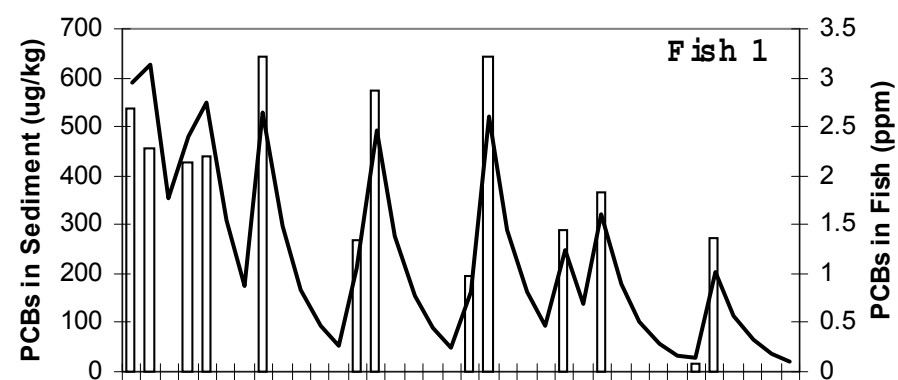
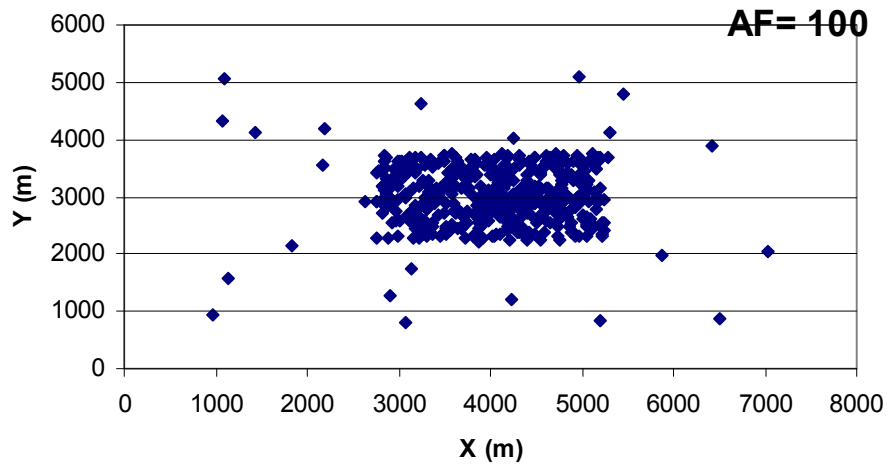
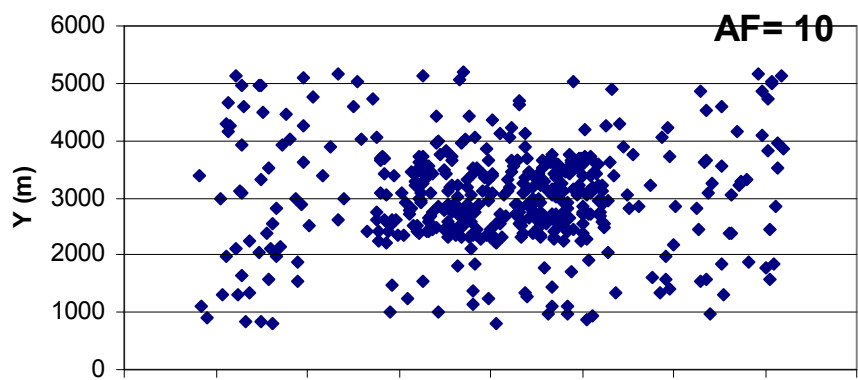
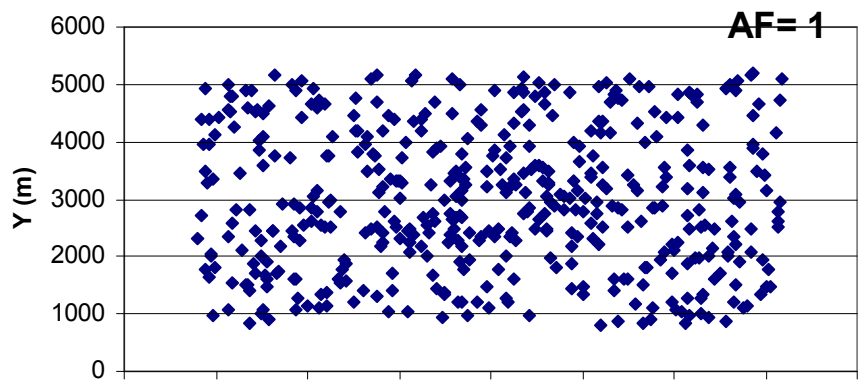


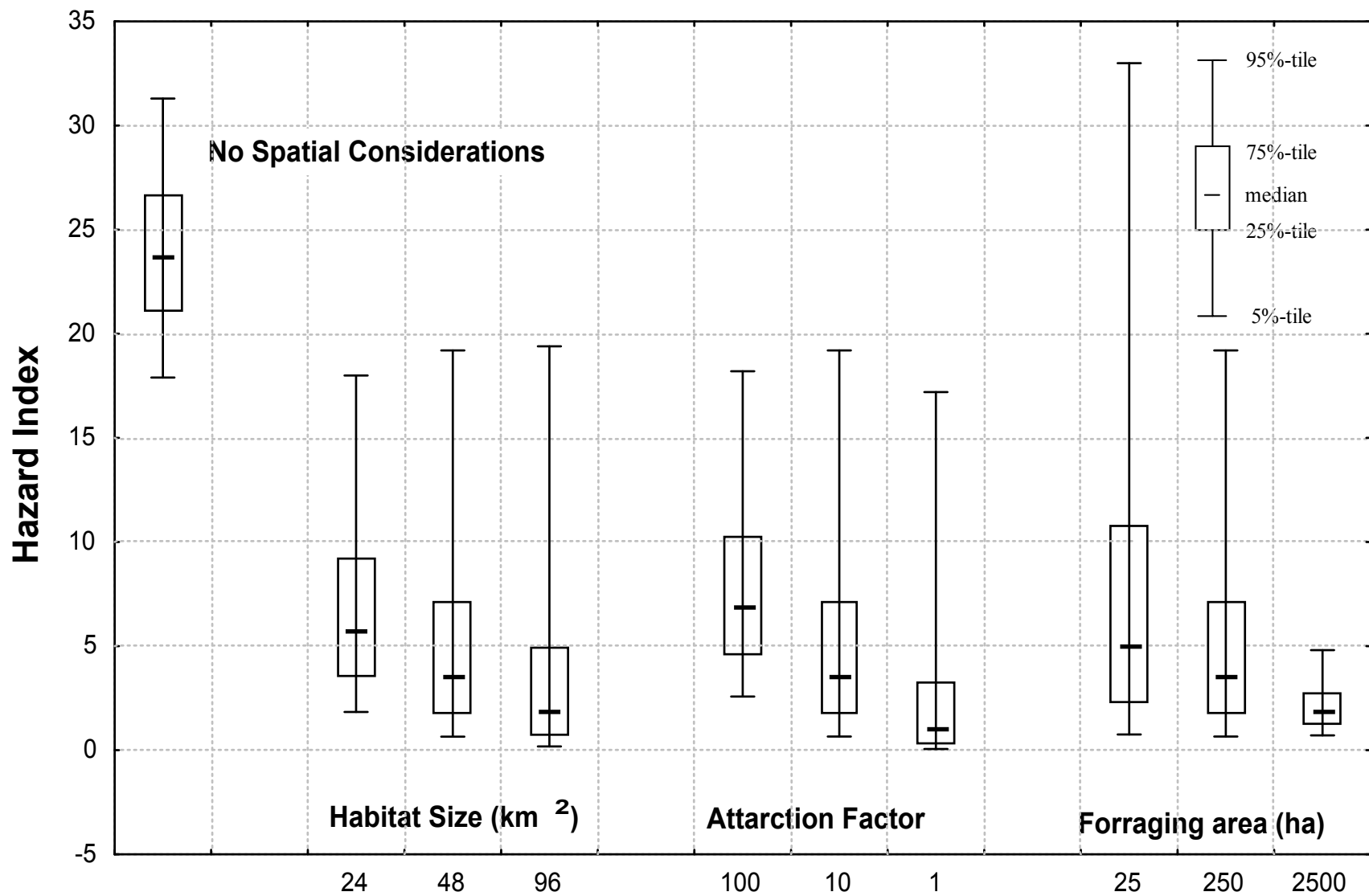
# Risk at Ecologically Relevant Spatial and Temporal Scales

- Contaminant concentration varies over space/time at disposal sites
- Animals spend variable amounts of time in or around disposal sites
- Risk estimates must include spatial/temporal variables



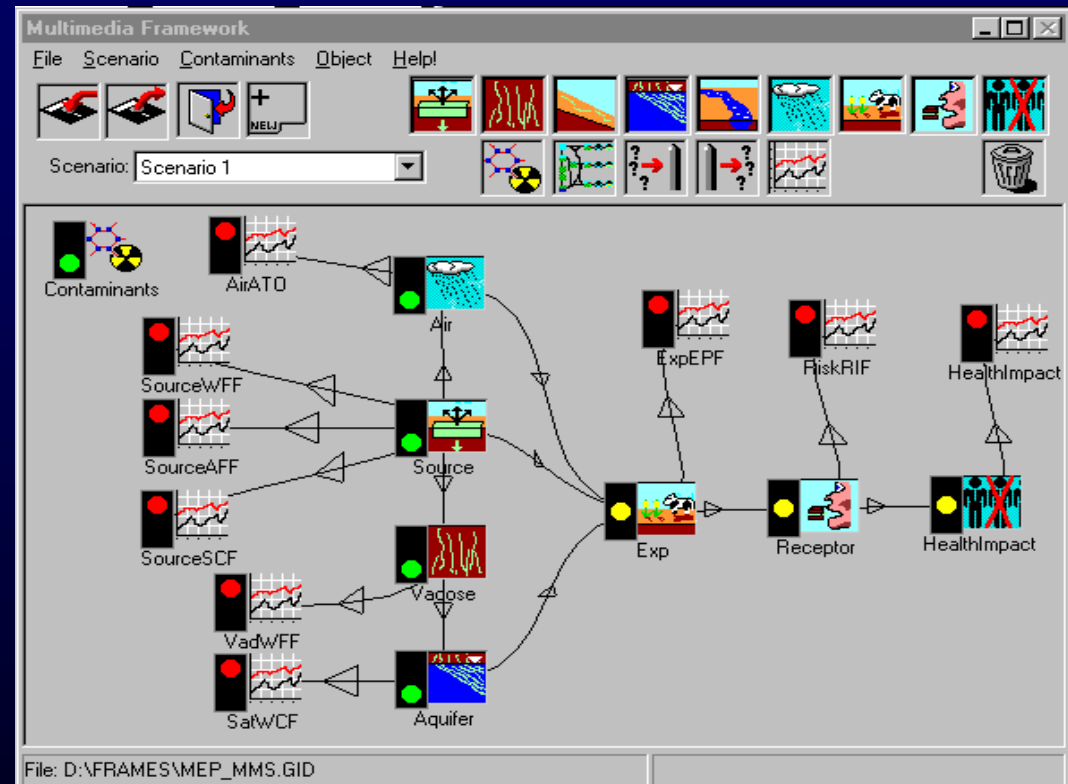






# Modeling To Estimate Human and Ecological Risk

- Screening and definitive assessments of risk require the use of models
- Army Risk Assessment Modeling System under development
  - Significant leveraging opportunity



# The Benefits of Risk

- Decision-making process made more explicit/consistent
- Reduced conservatism - increased management flexibility
- Ability to do comparative assessments and apply “what if” scenarios
- Ability to balance cost against incremental reductions in risk
- Site specific risk assessments are reusable, i.e, cost effective
- Opportunities for positive influence on revisions to the regulations